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ABSTRACT

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ONE GOOD REASON WHY ORIENTING DIRECTIONS WON'T HELP LEARNING

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Footnote

[1]The data for this experiment were collected while the author was at Southern Illinois University, Carbondale. Requests for reprints should be sent to Jack H. Hiller, SWRL, 4665 Lampson Avenue, Los Alamitos, California, 90720.

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ABSTRACT

A recent review of the literature, dealing with the effects of presenting instructional objectives on learning, determined that objectives failed to raise learning in about half the experiments. The interpretation for the failures exclusively relied on a theoretical analysis of problems with the technique. An alternative analysis, and supporting experimental evidence, suggests that objectives may fail precisely because certain instructional materials carry implicit objectives which experienced students can recognize, thereby rendering statements of objectives superfluous. It is suggested that researchers in this area collect data reflecting test expectancies and study activities of control subjects.

ONE GOOD REASON WHY ORIENTING DIRECTIONS WON'T HELP LEARNING

What procedures should teachers follow to reliably enhance designated student achievement? One rather obvious method would be telling the students in precise terms what their tests will contain. Indeed, Miles, Kibler, & Pettigrew (1967) found that students who were given the stems of their multiple-choice test items, as instructional material, significantly outperformed those who were given only a list of generally specified topics. Where test behavior is itself a valued outcome, teaching the test may have merit. However, where a test can only sample from the domain of criterion behaviors, as when learning outcomes constitute skill in applying principles and solving problems or when time available for testing is too limited, then teaching the test may inappropriately confine learning to the test alone. Furthermore, where test performance falls within the knowledge domain, providing students with test items as instruction may lead to rote associative learning devoid of understanding.

Conceptually related to providing test items for instruction is the technique of providing descriptions of learning outcomes, that is, stating instructional objectives. Logically, test items represent one end of a dimension of test cues or "orienting stimuli" as termed by Frase (1970). The wording of instructional objectives may be varied along this dimension from a degree of precision that achieves a comprehensive, detailed characterization of test performance (test questions and answers) to a vague exhortation to study unspecified materials for a test of an unspecified character. Perhaps surprisingly, a recent

review of the literature on the effects of providing students with relatively precise statements of instructional objectives determined that this technique failed to raise achievement about as often as it helped (Duchastel & Merrill, 1973). In an effort to uncover an explanation for the unreliable effects of stated objectives, Duchastel and Merrill classified experiments according to: 1. subject matter or type of learning; 2. level of schooling; 3. duration of experimental treatments; 4. degree of student control over preparation time; and 5. interactions between the use of objectives and individual differences. However, only the last variable was found to be related to learning, and this factor could only be applied to a few of the studies reviewed by them.

Duchastel and Merrill also suggested possible problems with the use of objectives that might account for the lack of significant effects in past research: 1. subjects might not have used the objectives because they did not realize their connection with the test; 2. objectives may be dimensionally complex (hence potentially ambiguous to students); the particular dimension--specificity--may not parallel the behavioral-nonbehavioral dimension (hence certain otherwise specific objectives may not have provided unambiguous description of criterion behaviors); 3. objectives may have been too extensive both in number and detail. This problem list exclusively attributes the failure of objectives as aids to learning to the objectives themselves, but an alternative explanation is possible.

It is necessary that two elementary assumptions be realized before one can logically derive a prediction that presenting objectives to students will raise learning: 1) Stated objectives must induce test preparatory behaviors different in kind and/or degree from behaviors engaged in by students receiving other treatments; 2) The distinct preparatory behaviors so induced must provide higher positive transfer to outcome testing than control preparation. In conventional research on the effects of objectives, the validity of the first assumption has been presupposed, while the second has been directly tested as the experimental hypothesis. Failure to achieve statistically significant treatment differences has rather automatically led researchers to examine the objectives to determine how they were inadequate. However, it is possible, even probable in certain instructional contexts, that non-significant differences resulted from a failure of the first assumption.

Such a circumstance would occur when the tested outcomes are anticipated by the control students who, thereby, generate appropriate objectives for themselves. Instruction that has been designed effectively at the outset will implicitly, if not explicitly, help students to discriminate important from relatively unimportant, if supportive, details and concepts, and will induce students to practice essential skills. In this case, objectives may fail not because they are ignored, or because they are ambiguous, but rather because effective instructional materials have rendered them superfluous.

Wow.

The experiment reported here is unusual in that the veracity of the first assumption was examined concurrently with a comparative test of a variety of orienting directions. Specifically tested in the context

of a lesson about child development read by Ed. Psych. students were: a.) general directions to learn the identity of researchers according to the characteristics of their research and findings; and/or to learn developmental principles and concepts; b.) to learn the above information by formulating and writing notes; c.) to study by answering inserted questions covering the information described above; d.) by studying without benefit of explicit orienting directions. All students were informed before studying that they would be given a fill-in-the-blank test. Half of the testable information was represented as inserted questions, which were repeated on the criterion test; the other half consisted of items that had not been inserted (items were chosen randomly from the pool for insertion). The inserted post question procedure in dominant use was modified to allow students to review their text after attempting answers (based on Hiller, 1973).

EXPERIMENT I

METHOD

Materials

The lesson was based on a 2265 word lecture, prepared by the investigator, that described concepts and principles of child development and in each instance specifically described the implications for educational practice. Researchers and theorists were identified for their contributions, and their research was described and linked to the developmental principles. The lesson was presented as a six page text with 350 to 400 words per page.

Each page presented two principles and identified two researchers except that one page mentioned three names and another page three principles. The test contained twelve name and twelve concept items which took the form of verbatim or paraphrase descriptions of research and characterizations of the principles; the student's task was to fill in the names of the researchers and principles which had been deleted from the test items. Half of the 12 name and half of the 12 concept items were randomly selected for use as inserted post questions, and these items were also included in the retention test.

Participants

Participants were 162 students who were fulfilling a requirement of their undergraduate Educational Psychology course.

Treatments

Nine treatment conditions were instituted as follows:

1. Control. Students were directed to study according to their individual habits and preference, thus permitting note writing and underlining; this freedom to excercise unrestricted use of pre-existing study skills (see Hiller,1973) is denoted below as "Free." The only orientation given to this group was the first statement of the text, common to all lessons: "We'll first consider certain facts about human motor development and then form a theoretical perspective about the nature of maturation and its implications for education."

2. Inserted Questions for names and terms, Restricted. After each page of text, a page containing one name and one concept question was inserted in the lesson. All students having inserted question treatments were

provided with directions on their use. The questions were described as "study aids" or "check points" to enable the student to check how well he was doing. The student was directed to study each page until he felt confident of his ability to answer a question(s) on its contents. It was stated that looking ahead to see what the question would be would defeat the method and invalidate the results. However, after writing the best answer he could think of (with the restriction that he not erase), the student was permitted to review freely. This treatment required that the student not mark his lesson nor take notes elsewhere to enable a test of the effects produced by this form of "Restricted" study activity.

3. Inserted Questions for names and terms, Free Study. Treatment directions employed here were the same as for #2 above, except that the students were given the same direction to study according to habit or preference that was given to the control group.

4. Instructional objectives for names and terms, Free Study. The following two objectives were described in the lesson page preceding the text: "To do your best on the test, you should be especially prepared to identify the developmental trends described and to provide technical terms for their definitions." A comparable objective was presented for names which required naming of the researcher "according to the research he performed or his findings."

5. Note writing for names and terms. The student was directed to mentally compose a short description of each researcher's study and its finding(s) and then to write this with the name on the back side of the source page; this procedure was designed to test the effect of enforced encoding. A comparable instruction was presented for writing the definition or description of each developmental concept.

6. Inserted question for names, Restricted Study.

7. Instructional objectives for names, Free study.

8. Inserted questions for terms, Restricted study.

9. Instructional objectives for terms, Free study.

Procedures

Students were randomly assigned to one of nine areas in a large lecture hall as they arrived at the session. Each student was given one of the lesson booklets and instructed to wait for directions. All lessons had a common cover sheet that first explained the experiment's purpose: "to test the relative effectiveness of different methods of studying for examinations." Next the cover informed them that they would take 30 minutes to study a lesson of about 2000 words, then fill out a brief questionnaire asking for opinions about the lesson and experimental study technique, and lastly take a 15 minute test. The experimenter read the directions aloud, and then had the students turn to the second page which presented directions for the study techniques. At the top of the second page in all booklets was a statement which explained that the test would require short, fill-in answers. After all students had completed studying directions for the study technique, they were set to work.

RESULTS

The lesson was rated as having average readability and above average interest. Ratings for the value of the study methods were not significantly different. Thirty minutes proved to be sufficient study time since nearly all students terminated overt study after 20-25 minutes. Similarly, most students finished the test after ten minutes; although announcing to them that answers had to be correctly spelled for credit was seen to produce added effort.

Mean test performances for the repeated, inserted question test items (see Table 1) were significantly different for both names and for terms by ANOVA performed on data to which the Arcsin transform had been applied (results were comparable without the transformation). Inserted Names $F(8,153) = 10.46$, $p < .0001$; Inserted Terms $F(8,153) = 6.67$, $p < .0001$. Name items used for the first time yielded $F(8,153) = 2.16$, $p < .03$; whereas the term items which hadn't been used failed to demonstrate treatment effects, $F(8,153) = .90$.

Newman-Keuls analyses ($p < .05$) for test items that had been used as inserted name questions showed the following (Table 2). Groups having practice with the name questions outperformed groups without that practice, except for: a.) the group instructed to study only for names (group 7); and b.) the group required to write notes (5). The two groups having combined name and term objectives outperformed only the group (9) given the objective for terms.

Analyses of results for inserted term items (Table 3) showed that the group which received the instruction to learn both names and terms (4) and the group that had inserted name questions (6) both retained significantly fewer less terms than the three groups who previously saw these questions as inserts (2,3,& 8) and the control group (1).

The relatively low performance by the Terms objective group (9) seemed odd, even though its retention for inserted term test questions was statistically inferior only to two of the groups who had seen the questions in their lessons (3&8). Therefore, an additional group of students (N=11) was run, but their performance was virtually the same (see results for group 10 in Table 1). An abstract possibility existed that the Term

- -
Insert Tables 1,2, & 3 about here
- -

objective was somehow ambiguous despite the distinct character of the terms, e.g., cephalocaudal, mass-to-specific, etc. But inspection of the notes written by the group required to take notes on terms (5) showed that an average of 12.4 terms of 13 possible were identified by each student.

The Newman-Keuls analysis for the name items that had not been used as inserts showed only that the instructional objective for names produced results superior to inserted questions for terms.

A final result to note is that overall retention for terms was significantly higher than for names (mean percent correct for twelve names = 11.3; for twelve terms = 28.8 and a t test for transformed [Arcsin] data = 10.0, $p < .001$).

EXPERIMENT II

The first experiment determined that orienting directions did not raise learning above control levels for terms but did for names. To enable a test of the hypotheses that the intrinsic character of the lesson, and student motivation, made directions for term learning superfluous, but directions for name learning a necessity, two additional studies were conducted. In the first, the names and terms appearing in the lesson were high-lighted and sequentially numbered. Fifteen students were instructed to rate each numbered item on a scale from 1-5 for the likelihood that the teacher who wrote the lesson represented this information in his test. A rating of 2 asserted that it was unlikely for the item to be tested, 3 that the item might be tested, and 4 that it would probably be tested. The mean rating for names was 2.7, whereas the mean for terms was 3.5, t (14) = 3.6, $p < .01$. Thus, students could anticipate testing for term knowledge better than for name knowledge, and in an absolute sense, name testing wasn't expected but term testing was.

In the second study, the possibility that the names were simply more difficult to learn was tested. One group (N = 12) was given the twelve test items for the names, with the names filled in and underlined to study. A second group (N = 17) was assigned to the set of term items, and a third group (N = 16) was given the combined list with the name and term items alternating. Participants were randomly assigned to these treatments at a single session and all were given 15 minutes to study. Given the test in its original format, the Name study group averaged 9.00 correct for names and 0.0 for the terms, while the Term study group averaged 0.0 for names and 8.87 for terms. Thus, differential learnability for names and terms in the lesson was not a factor.

It is interesting to observe that the group who studied both Names and Terms averaged 2.31 for the Names, but 4.63 for the Terms, t (15) = 4.83, $p < .001$; so that this difference would seem to reflect differential motivation to learn names *vs.* terms, in light of the above results. Indeed, a questionnaire given to the 43 students in this study immediately before testing, to determine their interest in learning about the identity of researchers *vs.* developmental principles, showed that the latter was much preferred, t (42) = 3.2, $p < .001$ (this result was consistent for all three groups).

DISCUSSION

Three points were demonstrated by the results. First, regarding the well-established principle that practice may help--direct practice with the test questions did, in fact, improve immediate retention for those questions.

The inserted post question procedure, modified to accommodate review after each question had been responded to, did not improve retention of incidental information; this finding replicates Gustafson and Toole (1970), Hiller (1973), and Denzel & Hiller (1973).

Second, although difficulty for learning technical terms was equivalent to that for learning researcher's names, term learning nearly tripled name learning. Questionnaire data showed that students thought knowledge of developmental principles, as represented by the term learning test items, was considerably more valuable than knowledge of which researcher had performed any particular developmental study or had discovered any developmental principle.

Third, and most important, orienting directions did not improve learning of developmental principles over control levels--most likely because the controls were able to infer that acquisition of such knowledge was the point of the lesson. Failure of the groups receiving instructional objectives for terms to outperform the control cannot be attributed to any ambiguity in the objectives, since the group required to write notes for terms correctly identified the terms in their notes and did not represent any other information by these notes (the same accuracy and reliability was also demonstrated for the researchers' names). In contrast to term learning, orienting directions for researchers' names, particularly practice on the name questions, did improve performance, but only because control students could not very well anticipate name-test-items, and did not otherwise value this knowledge.

Had the experiment been performed only with knowledge of developmental principles as the basis for instructional objectives and testing, the conclusion would have been correctly drawn that the instructional objectives were not helpful as aids to learning. And based upon this conclusion, the investigator might then have struggled to determine how the stated objectives were linguistically ambiguous or conceptually inadequate, had the experiment not also included the treatment which required students to write explicit notes for the terms. On the other hand, exclusive experimental focus on objectives concerned with learning the researchers' identities would have led to a positive finding for the value of presenting a general statement of instructional objectives.

This analysis should not be interpreted to mean that the wording and deployment of the term objectives could not have been improved. Rothkopf and Kaplan (1972) found, for example, that learning was improved by providing highly specific objectives rather than broad ones, such as the two used in the present study. It is quite possible that providing a check list of the 12 developmental terms represented in the test would have improved learning.

Based on the pattern of results obtained in this study for name and term learning, it would seem that data should be collected in future studies to reveal: a.) what material students believe to be worth learning; and b) what they expect their tests to cover, since this information may contribute to an understanding of how orienting directions affect mathemagenic behaviors.

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Table 1

Mean Percent Correct for Name (N) and Term (T) Retention Test Items[1]

TREATMENTS[2]	RETENTION TEST Mean Percent Correct						
	Inserted Questions		New Questions		Combined Items		
	N	T	N	T	N	T	N + T
1. C-Control	4	42	3	27	3	34	19
2. Question: N+T, Restricted	33	46	8	20	21	33	27
3. Question: N+T, Free	29	56	8	26	18	41	30
4. Instruct: N+T, Free	11	22	9	18	10	20	15
5. Instruct: N+T, Encode	13	33	4	22	9	28	19
6. Question: N, R	25	24	5	12	15	18	16
7. Instruct: N, F	28	31	13	20	20	26	23
8. Question: T, R	3	51	1	13	2	32	17
9. Instruct: T, F	1	30	4	22	2	26	14
10. Re-Run of #9	5	29	1	15	3	22	13

[1]All groups contain 18 replicates except #10 which contains 11.

[2]Treatment numbers here correspond to numbers used in the Method section.

Table 2

Newman-Keuls significance tests ($p < .05$) for inserted Name test items*

TREATMENTS	I,T	Q,T,R	C	I,N+T	I,N+T,E	I,N	Q,N,R	Q,N+T,F	Q,N+T,R

*Treatment means which are not significantly different at $p < .05$ are underlined by a common line.

Table 3

Newman-Keuls significance tests ($p < .05$) for inserted Term test items

TREATMENTS	I,N+T	Q,N,R	I,T	I,N	I,N+T,E	C	Q,N+T,R	Q,T,R	Q,N+T,F